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people against charlatans and quacks. To attain this purpose most effectually, no better plan could have been devised than to require that the people, at least, should be notified in advance, or have at their command the means of notifying themselves, of the authority and qualifications of those proposing to engage in a profession so nearly affecting the lives and health of themselves and families. Without some such notice and information, *the law would become entirely nugatory*" (Hilliard vs. The state, 7 Tex. appeals 69). The clerk of Kings county in this matter is a law to himself. There is no decision to sustain his position, and I have his admission that what you call 'an opinion' is not an opinion in any legal sense of the term.

One word as to the facts in the case you refer to. A notice calling the attention of the person arrested to the law was mailed him, and another was sent to his house. No reply was received to either. A 'sandwich advertisement' paraded Broome Street, calling attention to the 'Live and let live dispensary' conducted in his name. It is true he was locked up for fifteen minutes, but owing, I was told, to his conduct in the court. His entire detention did not last three hours. I consented to his discharge when I found that he was technically able to obey the law. He claimed to have offended through ignorance, and I accepted his statement without thoroughly believing it. I could have convicted him. He rewarded my leniency by bringing his absurd suit, that had no chance of success. He admitted, on cross-examination, that his verified complaint did not truly and fully state the facts of his arrest and the charge against him.

I have written at some length because you have been evidently misled. It is not possible for you to find an instance—I will not say of a reputable practitioner—of a person technically qualified to practise physic, or able to so qualify, who has been improperly prosecuted by the society. What has been done during the year by them appears in their annual report.

W. A. PURINGTON.

New York, Nov. 29.

[The letter which we print above comes too late to enable us to ascertain whether the case to which our correspondent refers in the next to the last paragraph of his letter is the same as the one to which we had reference in the editorial on p. 447 of *Science* (viii. No. 198); but we shall immediately investigate it, and, if any injustice has been done in the matter, it shall be rectified. The facts as stated by us were received from the physician himself, and we have known him for many years as a reputable practitioner and a graduate of one of the best medical colleges in the country. In reference to the 'opinion,' we do not know exactly how formal a declaration must be to make it 'legal'; but there is in the office of the county clerk of Kings county a memorandum, made by the clerk in his official book of registration, that on a given date, which we do not now recall, in the year 1885, Justices Cullen and Bartlett of the supreme court, on an application for advice by the clerk, gave it as their opinion that it was absurd that a physician should be expected to register in every county of the state, and that opinion has been the guide of the county clerk in the matter. We regret that we are unable to give the exact language of this opinion by reason of lack of time, but will do so in our next issue. —ED.]

The teaching of natural history.

Referring to your last issue, 'A. Reader's' difficulty seems to be that he looks upon the scientific name of an object as an *end-in-itself*; and, if I were to respond to his invitation to turn instructor in natural history for his special benefit, I should roughly counsel *him* (for he is evidently an old sinner), first of all to let names altogether alone. As, however, this is my first essay in teaching, I may be quite at fault, and perhaps am leaning too much on my own experience, when, after three years of working by myself on the name-plan, and thinking I knew a precious bit of entomology, I was brought to a dead halt by Agassiz, who gave me the outside of one dead fish to stare at for three long days, and afterwards some hundreds to describe and classify without any books and without any names. Letters and numerals were enough for that; and not till the work was done did I know what other people called these fish, otherwise than that Agassiz used the single word 'Haemulon' for them all, used simply as 'fish' might be,—as a mere convenience. Needless to say that I returned to entomology with a different and a more humble spirit. Looking as I do upon that lesson as my set-off in science, I may be giving it a too universal application, for I have had no experience in actual teaching; still, if I were to sum up my own conviction as to the proper method of teaching in natural history, it would be: specimens rather than (but not necessarily without) books; relationship rather than (but not necessarily excluding) names.

Now, to apply this to the little book (French's 'Butterflies') which seems to have sprung this discussion on a suffering public, and is thereby pretty well advertised. How much does it help a student to understand the relationship of our butterflies? There are three ways of doing this: 1°. By the actual arrangement of the material, a method which in the nature of things cannot be avoided. No reason for the particular sequence employed is given. 2°. By the definition of the groups. The arrangement provides for five families, twelve subfamilies or similar divisions, and fifty-one genera. Not a single one of the genera is defined; and, though short descriptions are given of the higher groups, these occupy, in all, scarcely more than 5 of the 305 pages given to the descriptive part of the book; all the rest is devoted to species. 3°. By analytical keys. One general key is given, and it occupies nearly twenty-six pages. Your reviewer called this "fairly good, so far as the perfect insect goes," and afterwards "faulty, because largely made up of unimportant characters, and because it takes no account of the earlier stages." 'A teacher' replies, "The key does trace into the families, the genera, and the species; and all the families and genera are more or less fully characterized either in the key or in the body of the work." As stated above, not one genus is characterized as such in the body of the work: therefore this must be interpreted as saying that all the genera are characterized in the key. This is true of all but *Melitaea* (the names of *Neonympha* and *Calephelis* having been accidentally omitted in their proper place); but let us see what the characterization amounts to, as a clew to arrangement or comparative structure. There are, in all, 443 categories used; but as 214 of these lead directly to species only, in which structural differences are much less to

be looked for, and which therefore may be omitted so as to place the key in the most favorable light, there remain 229, which lead to families, genera, and groups of species. Now, what characters are employed in these higher categories? Will it be believed that there are only about one-fourth of them which have the slightest allusion to a single structural feature? That seventy-two per cent are altogether given up to the mere matter of the coloring of the wings, rarely including even the distribution of this color in patterns? This is the key which 'A. Reader' pronounces 'excellent,' which subserves no possible use as a guide to relative structure or affinities, but *only* to discover a *name*. Its author and 'A. Reader' appear to be afflicted with the same malady. Your reviewer surely made a mistake in calling the key 'fairly good,' for it teaches nothing of the basis of affinities, which it might have been made to do without lessening one whit its value in the special direction sought.

SAMUEL H. SCUDDER.

Cambridge, Nov. 26.

Abnormal embryos of trout and salmon.

In *Science observer*, vol. v. No. 1, pp. 1-8, S. Garman and S. F. Denton have figured and described a number of abnormal embryos of trout and salmon; and, under the head of 'Conclusions,' offered "a few conjectures as to the cause and manner of origin of these monstrosities." These conjectures appear to merit a word of comment. Considering it improbable that many of the forms described could arise by fission, an attempt is made to account for their origin at separate points of the surface of the vitellus. It is argued that several spermatozoa must penetrate the egg-membrane at different points. But how can they accomplish this when only one place—the micropyle—has been provided for their entrance? The possibility—not to say probability—of all passing through the micropyle does not appear as one of the conjectures. 'Plurality of micropyles' is noted as one of the possibilities, but another hypothesis is urged as the more acceptable; namely, imperfections in the egg-membrane, due to premature extrusion of the eggs. "The finishing touches being put on the outer covering of the egg, the capsule is most likely to prove unfinished if the eggs are taken too soon. . . . While the capsule in maturity may resist the intrusion of spermatozoa, compelling entrance at the micropyle, in imperfect condition the same capsule would prove a less effective barrier at its pores or elsewhere." All this seems to be disposed of by the well-known fact that the membrane is formed long before the egg is ripe enough to develop. It has been shown that the micropyle is only large enough to admit one spermatozoon at a time, and the impossibility of entering the minute pores has been pointed out more than once.

A strange assumption underlies most of these conjectures: it is the idea that a spermatozoon, without uniting with the female pronucleus, can give rise to an embryo. This point is not directly asserted, but taken for granted, as if it had nothing unnatural or preposterous in it. In the light of what is now known of fecundation, such an idea, to say the least, is wholly untenable. But if this idea is dropped, most of the 'conclusions' are left completely in the air.

That superfetation may be the cause, or one of the

causes, which leads to the formation of monsters, has been made very probable by recent observations; but we can hardly regard this as a certainty so long as such men as Professor Kupffer maintain that more than one spermatozoon is required for the normal fertilization of these very fish-eggs.

As to the mode of origin of monsters,—if I may be allowed to express an opinion on the merits of the various theories that have been offered on the subject,—I should say that Lereboullet and Rauber are the only ones who have succeeded in presenting views which are acceptable from an embryological stand-point. Rauber has dealt with the subject in a very thorough manner, and has shown how two or more embryos could arise from the same germ-ring. If two embryos were formed at opposite sides of the ring, their final position would be on opposite sides of the egg, with the heads pointing in the same direction, precisely as represented in the figures of Garman and Denton. We can hardly do better than accept this view until something better is offered to replace it. In supposing themselves limited to the alternatives of, 1°, fission, and, 2°, formation at different germinal centres, these authors have entirely overlooked the more rational mode of interpretation suggested by Lereboullet (*Ann. des sc. nat.*, 1863), and amplified and extended by Professor Rauber (*Virchow's Arch. f. pathol. anat.* lxxi. No. 1, and 'Primitivstreifen und neurula der wirbelthiere,' Leipzig, 1877).

C. O. WHITMAN.

Milwaukee, Nov. 25.

The deepest fresh-water lake in America.

Mr. L. W. Bailey's letter with the above heading (*Science*, viii p. 412), calling attention to the extraordinary depth of Crater Lake in Oregon, seems to indicate that he regards Lake Temisconata, in the Province of Quebec in Canada, as being an exceptionally deep fresh-water lake. The subjoined figures will illustrate to what extent this idea is sustained by actual soundings:—

| Fresh-water lake. | Height of surface above sea. | | Maximum depth. | | |
|-------------------|------------------------------|---------|----------------|---------|--------------|
| | Feet. | Metres. | Feet. | Metres. | |
| Temisconata | 400 | 121.9 | 500 | 152.4 | Bailey. |
| Superior..... | 609 | 185.6 | 1,010 | 307.8 | Lake survey. |
| Michigan..... | 582 | 177.4 | 864 | 263.3 | " " |
| Huron..... | 582 | 177.4 | 705 | 214.9 | " " |
| Erie..... | 573 | 174.6 | 324 | 98.7 | " " |
| Ontario..... | 247 | 75.3 | 738 | 224.9 | " " |
| Tahoe..... | 6,247 | 1,904.1 | 1,645 | 501.4 | LeConte. |
| Crater..... | — | — | 1,996 | 608.4 | Dutton. |
| Leman..... | 1,226 | 373.7 | 1,017 | 310.0 | Forel. |
| Como..... | 699 | 213.0 | 1,926 | 587.0 | |
| Maggiore..... | 686 | 209.0 | 2,612 | 796.0 | |
| Baikal..... | 1,360 | 414.5 | 12,356 | 3,766.0 | |

There seem to be unaccountable discrepancies in the depths assigned by different authorities to the chain of lakes lying between Canada and the United States. The table of mean depths given in Johnston's 'Physical atlas' and in Herschel's 'Physical geography' must be erroneous. Some authorities give the maximum depth of Huron as about 1,800 feet. The depth of Lake Baikal appears to be almost incredible (*vide Nature*, xvii. p. 468).

JOHN LECONTE.

Berkeley, Cal., Nov. 17.